United States Patent [19]

Baliga et al.

[11] **4,343,015**

[45] **Aug. 3, 1982**

[54] **VERTICAL CHANNEL FIELD EFFECT TRANSISTOR**

[75] Inventors: **Bantval J. Baliga; James R. Shealy,** both of Clifton Park, N.Y.

[73] Assignee: **General Electric Company,** Schenectady, N.Y.

[21] Appl. No.: **149,936**

[22] Filed: **May 14, 1980**

[51] **Int. Cl.**[3] **G01L 29/06**

[52] **U.S. Cl.** **357/55;** 357/22

[58] **Field of Search** 357/22, 55

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,129,879	12/1978	Tantraporn et al.	357/22
4,171,234	10/1979	Nagata et al.	357/55
4,262,296	4/1981	Shealy et al.	357/55

OTHER PUBLICATIONS

Donnelly et al., "Multiple-Energy Proton Bombardment in n+-GaAs", *Solid State Electronics,* 1977, vol. 20, pp. 183-189.

Stein, H. J.; "Electrical Studies of Low Temperature Neutron-and Electron-Irradiated Epitaxial n-Type GaAs", *J. of Applied Physics,* vol. 40, No. 13, Dec. 1969.

Foyt et al., "Isolation of Junction Devices in GaAs Using Proton Bombardment", *Solid State Electronics,* 1969, vol. 12, pp. 209-214.

Primary Examiner—R. A. Rosenberger

Attorney, Agent, or Firm—Charles E. Bruzga; James C. Davis, Jr.; Marvin Snyder

[57] **ABSTRACT**

Improved high frequency GaAs FETs have a higher breakdown voltage, lower input gate capacitance and lower source (or drain) resistance. A preferentially etched groove structure yields parallel trapezoidal semiconductor fingers that are wider at the top than at the bottom. Every finger intersects a high resistivity, semi-insulating region which surrounds the active device area and is fabricated by high energy particle bombardment. Metal gates are deposited within the grooves on three sides of the trapezoidal fingers.

12 Claims, 11 Drawing Figures